इंटरनेट मानक

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"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 11093 (2001): Iron Ore Lumps for Direct Reduction Processes [MTD 30: Sponge Iron and Smelting Reduction]

"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
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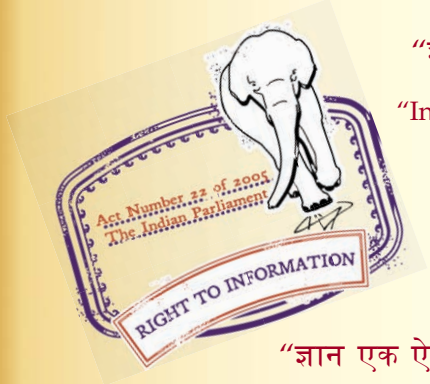

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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भारतीय मानक

प्रत्यक्ष अपचयन प्रक्रमणों के लिए लौह अयस्क पिंड — विशिष्टि

(दूसरा पुनरीक्षण)

Indian Standard

IRON ORE LUMPS FOR DIRECT REDUCTION PROCESSES — SPECIFICATION

(Second Revision)

ICS 73.060.10

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 2001

Price Group 2

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Sponge Iron and Smelting Reduction Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1984 and subsequently revised in 1991. In this revision, Fe, S, P, CaO+MgO and moisture contents have been upgraded in view of the present requirement of iron ore lumps for direct reduction. Apart from these, size distribution of iron ore lump at the point of despatch for coal based as well as for gas based processes has also been given separately with modified one.

In recent years, sponge iron has gained prominence as a feed stock for steel making in electric arc furnace or in oxygen steel making and other steel making processes. Quality of iron ore lumps plays a significant role for the production of sponge iron by direct reduction, and so it is essential to ensure the supply of suitable quality of iron ore lumps for direct reduction.

No marking clause has been included in this standard as iron ore lumps are supplied loose.

The composition of the committee responsible for formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 1 AUGUST 2010
TO
IS 11093 : 2001 IRON ORE LUMPS FOR DIRECT REDUCTION PROCESSES — SPECIFICATION

(Second Revision)

(*Page* 1, *clause* **2**) — Substitute 'IS 9660 : 2001 Method for determination of softening — Melting characteristics of iron ore lumps/pellets/sinter (*first revision*)' *for* 'IS 9660 : 1980 Guidelines for determination of softening characteristics of iron ore pellets' and 'IS 10823 : 1994 Methods of determination of thermal degradation index (TDI) and reduction degradation index (RDI) of iron oxides: lump ore, sinter and pellets (*first revision*)' *for* 'IS 10823 : 1984 Method for determination of thermal degradation index (TDI) and reduction degradation index (RDI) or iron oxides: lumps ores, sinter and pellets'.

[*Page* 1, *clause* **4.1**, *tabular matter*, Fe (Total)] — Substitute '65.0, *Min*' *for* '66.0 *Min*'.

[*Page* 1, *clause* **4.1**, *tabular matter*, SiO_2 + Al_2O_3] — Substitute '5.0, *Max*' *for* '4.0, *Max*'.

[*Page* 1, *clause* **4.1**, *tabular matter*, Total of Pb, Zn, Cu, Sn, Cr and As] — Substitute '0.01, *Max*' *for* '0.02, *Max*'.

(*Page* 2, *clause* **5.1**, *tabular matter, For Coal Based Size only*) — Substitute the following for the existing:

'*Size*	*For Coal Based*
+ 30 mm	Nil
+ 5-20 mm	90 %, *Min*
+ 20-25 mm	5 %, *Max*
– 5 mm	5 %, *Max*'

(*Page* 2, *clause* **5.1**, *tabular matter, For Gas Based Size* '+31 *mm*') — Substitute '5%' *for* 'Nil'.

(MTD 30)

Reprography Unit, BIS, New Delhi, India

Indian Standard

IRON ORE LUMPS FOR DIRECT REDUCTION PROCESSES — SPECIFICATION

(Second Revision)

1 SCOPE

1.1 This standard covers the specification of iron ore lumps for both solid and gaseous reductant based direct reduction processes for production of sponge iron to be used in the production of steel in electric arc furnace and oxygen steel making processes, etc.

1.2 Requirements covered in this standard shall be met at the point of receipts, unless it is stated otherwise.

2 REFERENCES

The following Indian Standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

IS No.	*Title*
1387 : 1993	General requirements for the supply of metallurgical materials (*second revision*)
1405 : 1982	Methods of sampling iron ores (*second revision*)
1493 : 1959	Methods of chemical analysis of iron ores
1493	Methods of chemical analysis of iron ores:
(Part 1) : 1981	Determination of common constituents (*first revision*)
(Part 3) : 1987	Determination of titanium, chromium, vanadium, calcium and magnesium by atomic absorption spectrophotometry
(Part 4) : 1988	Determination of aluminium by atomic absorption spectrophotometry
(Part 5) : 1990	Determination of copper content by atomic absorption spectrometric method
(Part 6) : 1990	Determination of sodium and/or potassium content by atomic absorption spectrometric method
6495 : 1984	Method of tumbler test for iron oxides pellets ores, sinter and pellets (*first revision*)
8167 : 1989	Method for determination of reducibility of iron ore and sinter
9660 : 1980	Guidelines for determination of softening characteristics of iron ore pellets
10823 : 1984	Method for determination of thermal degradation index (TDI) and reduction degradation index (RDI) or iron oxides : lumps ores sinter and pellets
11283 : 1985	Method for determination of softening point of iron oxides (in powder form) lump ore, sinter and pellets
11292 : 1985	Method for determination of relative reducibility of iron oxides : lump ores, sinter and pellets

3 SUPPLY OF MATERIAL

The material shall be supplied in accordance with the provisions of IS 1387.

4 CHEMICAL COMPOSITION

4.1 The lumps shall conform to the following chemical analysis (dry LOI free basis). However, the actual specification of the ore required shall have to be agreed between the purchaser and the supplier.

Constituent	*Percentage*
Fe (Total)	66.0, *Min*
$SiO_2 + Al_2O_3$	4.0, *Max*
$CaO + MgO$	0.5, *Min*
S	0.01, *Max*
P	0.04, *Max*
Total of Pb, Zn, Cu Sn, Cr and As	0.02, *Max*
Alkali ($Na_2O + K_2O$)	to be agreed upon between the supplier and the purchaser
Loss on ignition	1% *Max*
Moisture	1% *Max* during dry season and 2% *Max* during rainy season or as agreed upon in both cases

4.2 The chemical analysis of the iron ore lumps shall be determined by the method specified in IS 1493 and its parts (1, 3, 4, 5 and 6) as per latest version or any other established, instrumental/chemical method. In case of dispute, the procedure in the latest edition of IS 1493 for chemical analysis shall be the referee method (for example employing X-ray fluorescence technique).

5 SIZE

5.1 The size range for iron ore lumps at the point of dispatch shall be as follows. Requirements for the iron ore lumps at the point of dispatch is applicable to this clause only, as degradation of lumps may occur during transportation:

Size	*For Coal Based*	*For Gas Based*
+ 31 mm	Nil	Nil
− 31 +25 mm	Nil	5 %, *Max*
− 25 +19 mm	2 %, *Max*	10 %, *Max*
− 19 + 9 mm	93 %, *Min*	65-85 %
− 9 + 6 mm		8 %, *Max*
− 6 mm	5 %, *Max*	2 %, *Max*

5.2 The screen analysis of the material at the point of receipt depends on the handling and transportation and shall, therefore, have to be agreed between the supplier and the purchaser and −6.3 mm fraction should not exceed 5 percent.

6 REDUCIBILITY

6.1 The reducibility of the iron ore lumps shall be 0.5 percent per minute minimum, (*dR/dt* at 40 percent reduction), when determined by the method specified in IS 8167.

6.2 The relative reducibility of the iron ore lumps at the end of 3 h shall be 55 percent, minimum when determined as per the method given in IS 11292.

7 DEGRADATION INDEX

The degradation index of the iron ore lumps shall not be more than 10 percent maximum. The criterion for the iron ore degradation is the portion of − 1 mm in the reduced product, when determined in accordance with IS 10823.

8 SOFTENING CHARACTERISTICS

8.1 Softening characteristics of iron ore lumps (in bulk form) shall be determined in accordance with IS 9660 and its requirement shall be agreed to between the supplier and the purchaser. A typical value of the start of softening temperature should be 1 125°C minimum.

8.2 The softening point of the lumps (in powder form) when determined as per IS 11283 should show a minimum softening start temperature of 1 150°C.

9 TUMBLER INDEX

Tumbler index of iron ore lumps shall be 88 percent *Min* and abrasion index 5 percent when tested in accordance with IS 6495.

10 SAMPLING

Representative samples of iron ore lumps shall be drawn according to the scheme of sampling given in IS 1405.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Sponge Iron & Smelting Reduction Sectional Committee, MTD 30

Organization	*Representatives*
Tata Iron & Steel Co Ltd, Jamshedpur	DR AMIT CHATTERJEE (*Chairman*)
Central Fuel Research Institute, Dhanbad	REPRESENTATIVE
Essar Steels, Mumbai	SHRI K. JYOTHI
Gas Authority of India, New Delhi	SHRI R. G. RAJAN
	SHRI P. S. SAREEN (*Alternate*)
GSAL Ltd, Hyderabad	SHRI K. P. PATNAIK
	SHRI K. S. N. MURTHY (*Alternate*)
HEG Ltd, Durg	SHRI S. N. MISHRA
Ispat Industries Ltd, (Nippo Denro), Raigad	SHRI V. V. JAMNIS
	SHRI A. K. SAXENA (*Alternate*)
Jindal Steel & Power Ltd, Raigarh	SHRI K. C. THATOI
	SHRI U. BHATTACHRJEE (*Alternate*)
Kudremukh Iron Ore Co Ltd, Chikmaglur	SHRI T. R. R. RAO
MECON (India) Ltd, Ranchi	SHRI P. BHATTACHARYA
	SHRI A. K. AGRAWAL (*Alternate*)
Ministry of Steel, New Delhi	SHRI D. KASHIVA
	SHRI S. K. BHATNAGAR (*Alternate*)
M. N. Dastur & Co (P) Ltd, Kolkata	SHRI ADHIP SENGUPTA
	MS ADITI TARAFDAR (*Alternate*)
Monnet Ispat Ltd, Raipur	SHRI B. L. VERMA
Mukand Ltd, Thane	SHRI C. H. SHARMA
National Metallurgical Laboratory, Jamshedpur	DR SWATANTRA PRAKASH
National Mineral Development Corporation Ltd, Hyderabad	REPRESENTATIVE
Nova Iron & Steel Co Ltd, Bilaspur	SHRI A. RAJASEKARAN
	SHRI B. GOPICHAND (*Alternate*)
Orissa Sponge Iron Ltd, Distt Keonjhar	SHRI N. K. PATNAIK
	SHRI S. C. JENA (*Alternate*)
Prakash Industries, New Delhi	REPRESENTATIVE
Raipur Alloys, Raipur	SHRI N. RATH
SAIL, R&D Centre, Ranchi	SHRI G. I. S. CHAUHAN
	DR K. K. PRASAD (*Alternate*)
Sponge Iron Manufacturers' Association, New Delhi	SHRI S. S. BHATNAGAR
Sponge Iron India Ltd, Khammam	SHRI M. AMARESHWAR RAO
Steel Furnace Association of India, New Delhi	SHRI M. S. UNNINAIR
Sunflag India Ltd, Bhandara	SHRI D. K. GAUR
	SHRI S. P. DASH (*Alternate*)
TATA Sponge Iron, Distt Keonjhar	SHRI B. M. SARANGI
Usha (India) Ltd, New Delhi	SHRI B. K. ROY
Vikram Ispat, Mumbai	DR S. K. S.YADAV
BIS Directorate General	SHRI N. MITRA, Director & Head (MTD)
	[Represening Director General (*Ex-officio*)]

Member-Secretary
SHRI RAM AWADH RAM
Deputy Director (MTD), BIS

Bureau of Indian Standards

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Review of Indian Standards

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